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FIG.1

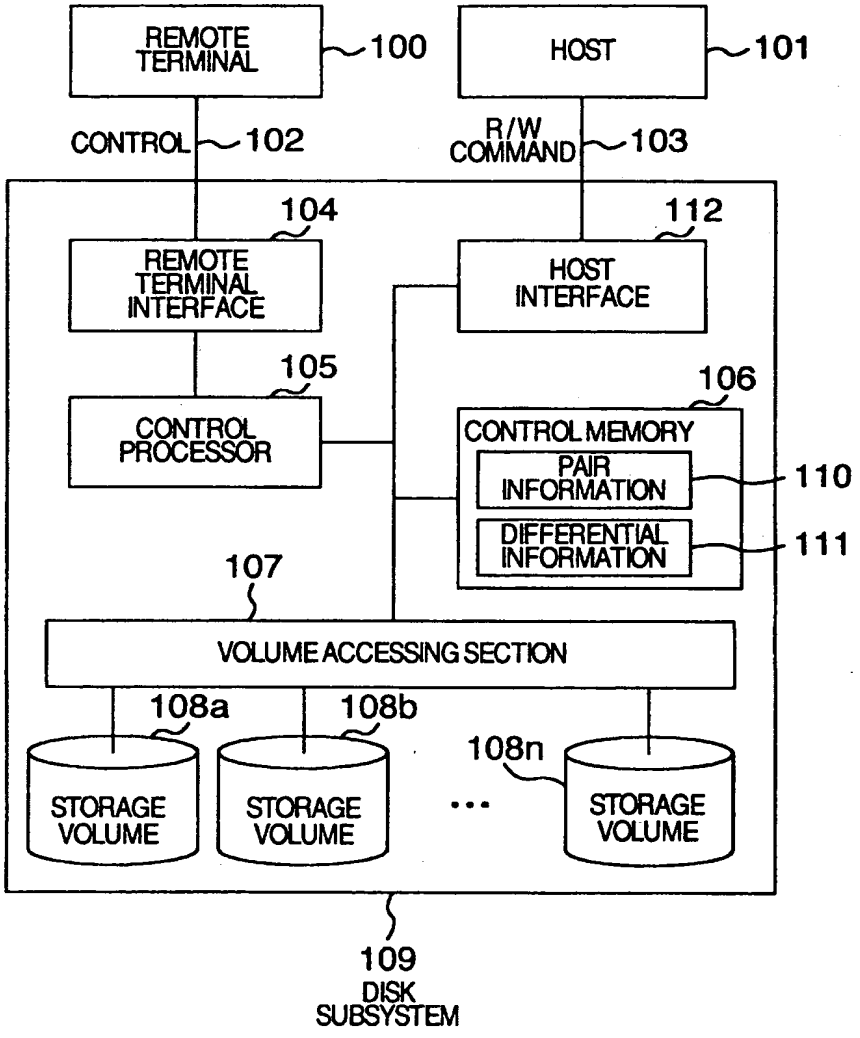
REMOTE TERMINAL
100
HOST
101
CONTROL
102
R/W COMMAND
103
104
112
REMOTE TERMINAL INTERFACE
HOST INTERFACE
105
106
CONTROL PROCESSOR
CONTROL MEMORY
PAIR INFORMATION
110
DIFFERENTIAL INFORMATION
111
107
VOLUME ACCESSING SECTION
108a
108b
108n
STORAGE VOLUME
STORAGE VOLUME
STORAGE VOLUME
109
DISK SUBSYSTEM

FIG.2

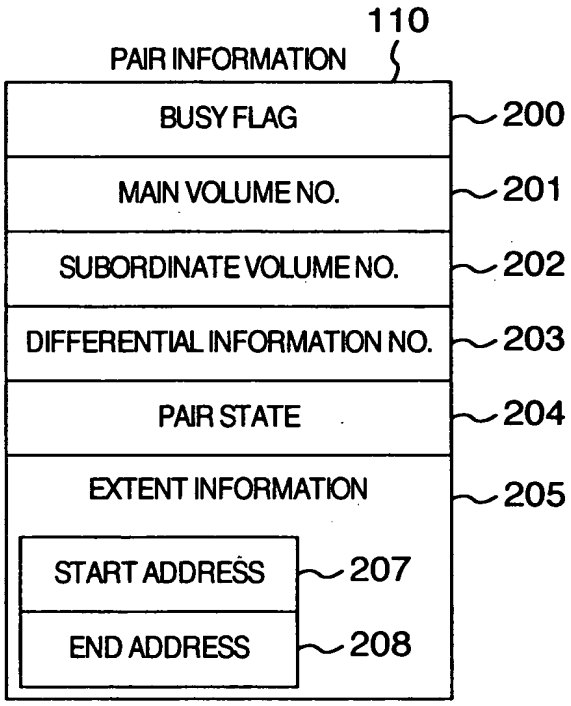
110
PAIR INFORMATION
BUSY FLAG
200
MAIN VOLUME NO.
201
SUBORDINATE VOLUME NO.
202
DIFFERENTIAL INFORMATION NO.
203
PAIR STATE
204
EXTENT INFORMATION
205
START ADDRESS
207
END ADDRESS
208

FIG.3

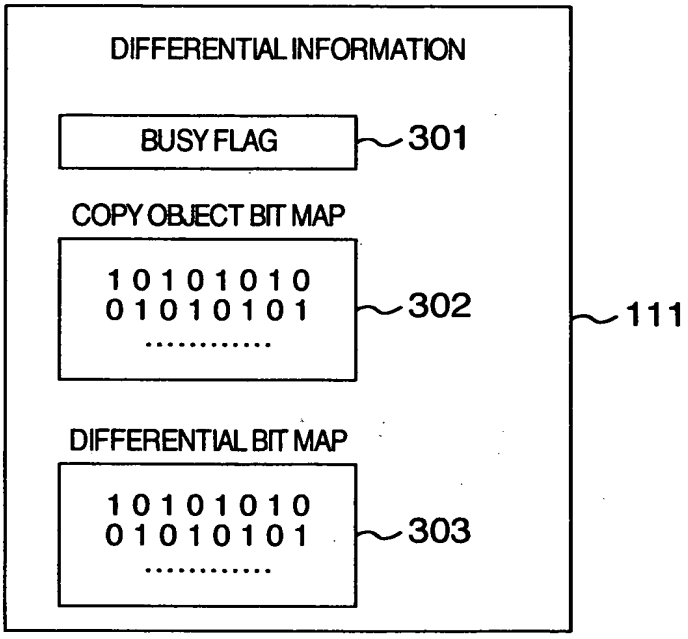
DIFFERENTIAL INFORMATION
BUSY FLAG
301
COPY OBJECT BIT MAP
1 0 1 0 1 0 1 0
0 1 0 1 0 1 0 1
.....
302
111
DIFFERENTIAL BIT MAP
1 0 1 0 1 0 1 0
0 1 0 1 0 1 0 1
.....
303

FIG.4

PROCESSING OF HOST 101 TO EXECUTE BATCH PROCESSING

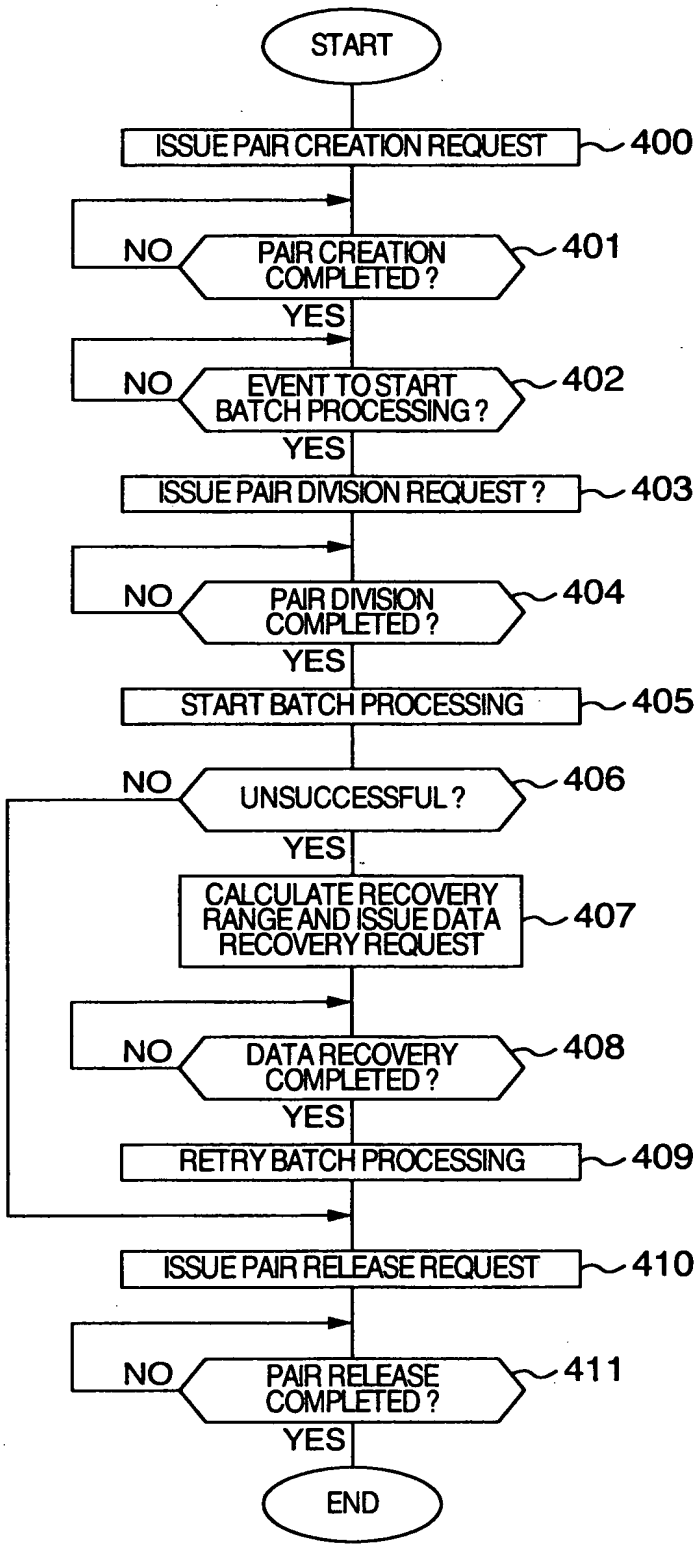

FIG.5

PROCESSING OF DISK SUBSYSTEM 109

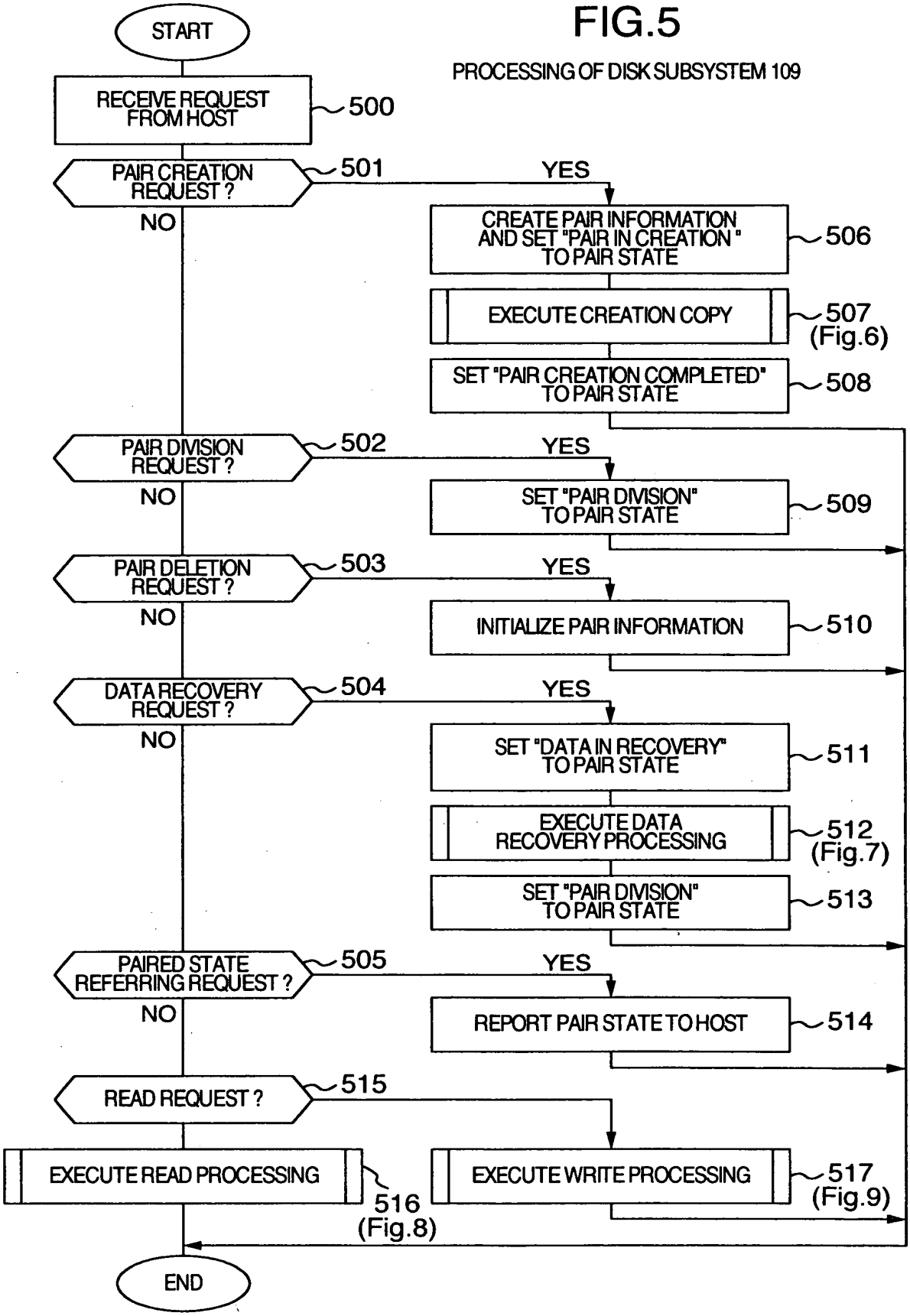

FIG.6

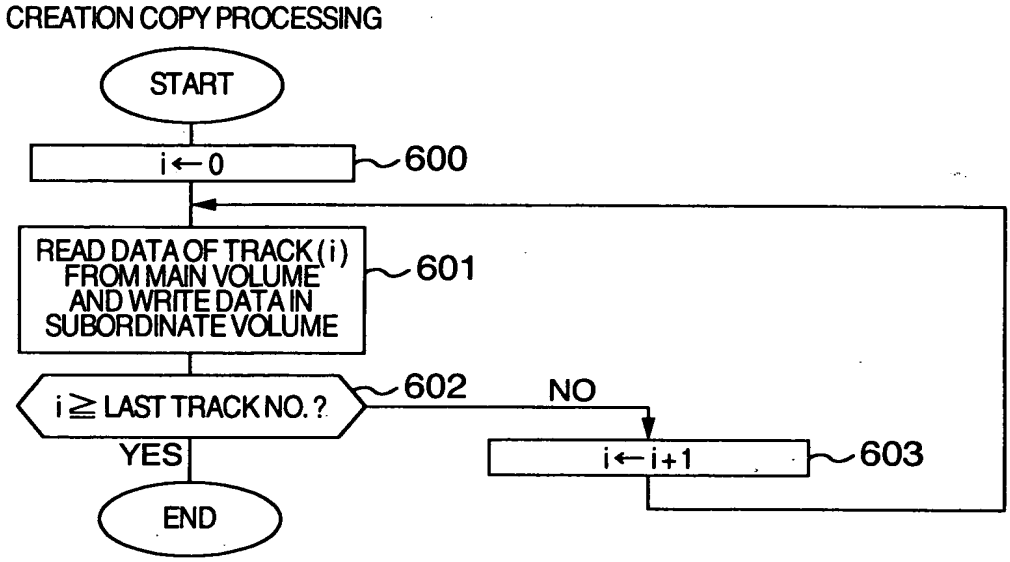
CREATION COPY PROCESSING
START
i←0
600
READ DATA OF TRACK (i) FROM MAIN VOLUME AND WRITE DATA IN SUBORDINATE VOLUME
601
i≧LAST TRACK NO.?
602
NO
YES
i←i+1
603
END

FIG.7

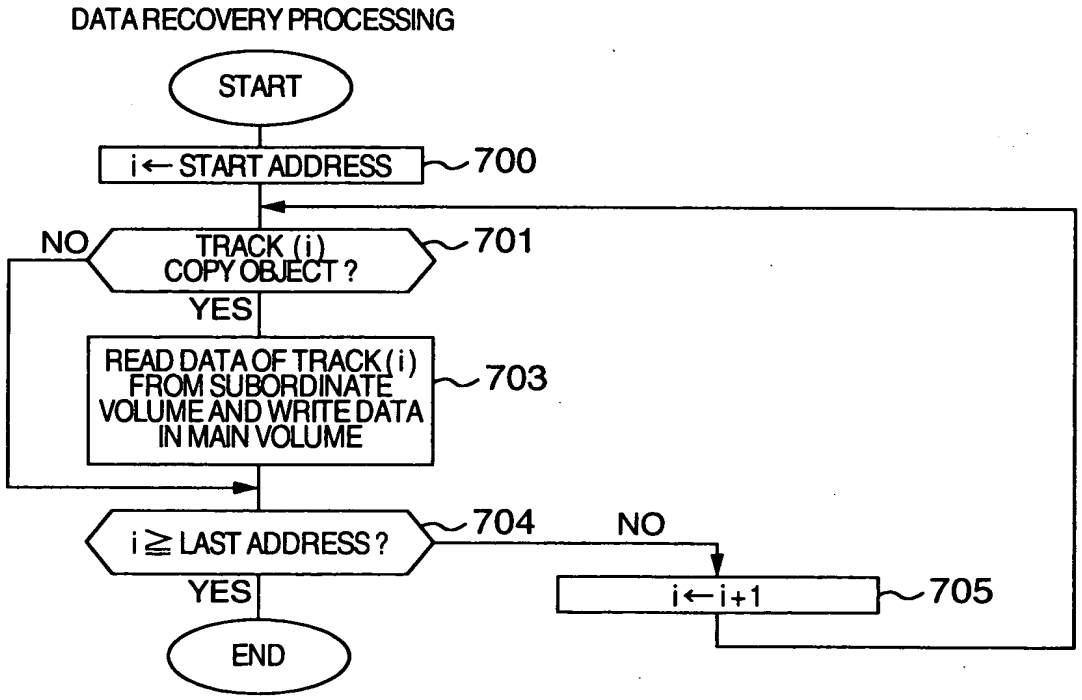
DATA RECOVERY PROCESSING
START
i←START ADDRESS
700
NO
TRACK (i) COPY OBJECT ?
701
YES
READ DATA OF TRACK (i) FROM SUBORDINATE VOLUME AND WRITE DATA IN MAIN VOLUME
703
i≧LAST ADDRESS ?
704
NO
YES
i←i+1
705
END

FIG.8

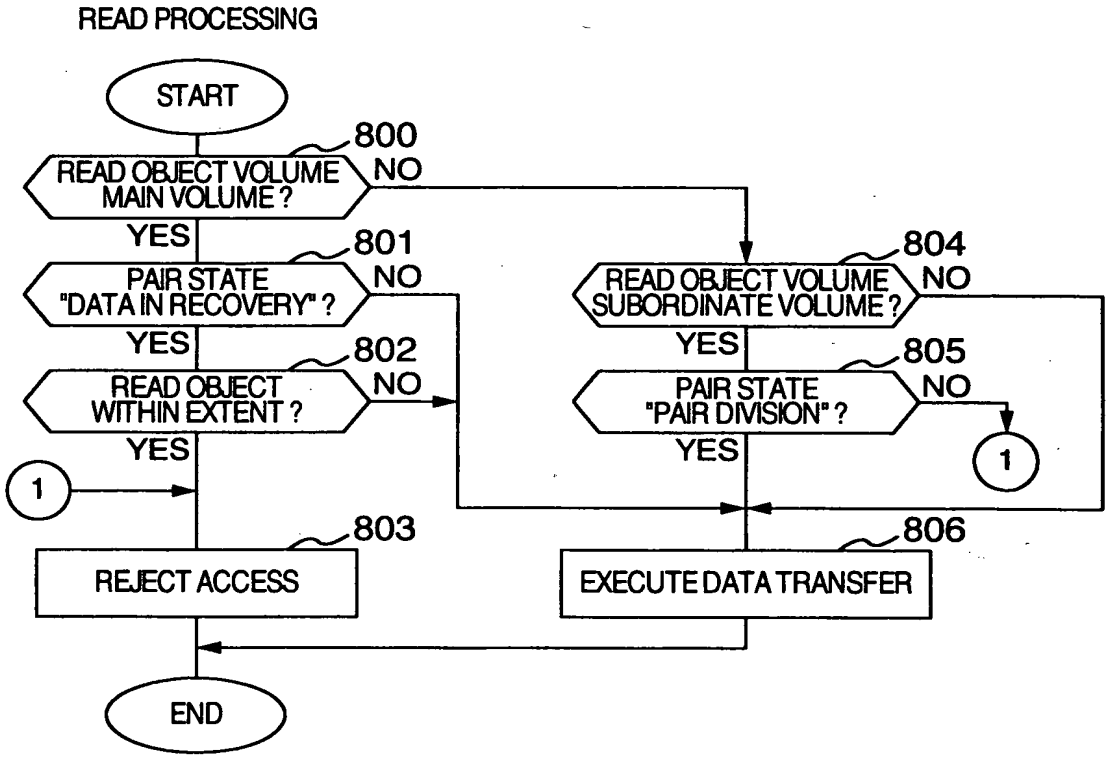
READ PROCESSING
START
800
READ OBJECT VOLUME MAIN VOLUME ?
NO
YES
801
PAIR STATE "DATA IN RECOVERY" ?
NO
YES
802
READ OBJECT WITHIN EXTENT ?
NO
YES
1
803
REJECT ACCESS
END
804
READ OBJECT VOLUME SUBORDINATE VOLUME ?
NO
YES
805
PAIR STATE "PAIR DIVISION" ?
NO
YES
1
806
EXECUTE DATA TRANSFER

FIG.9

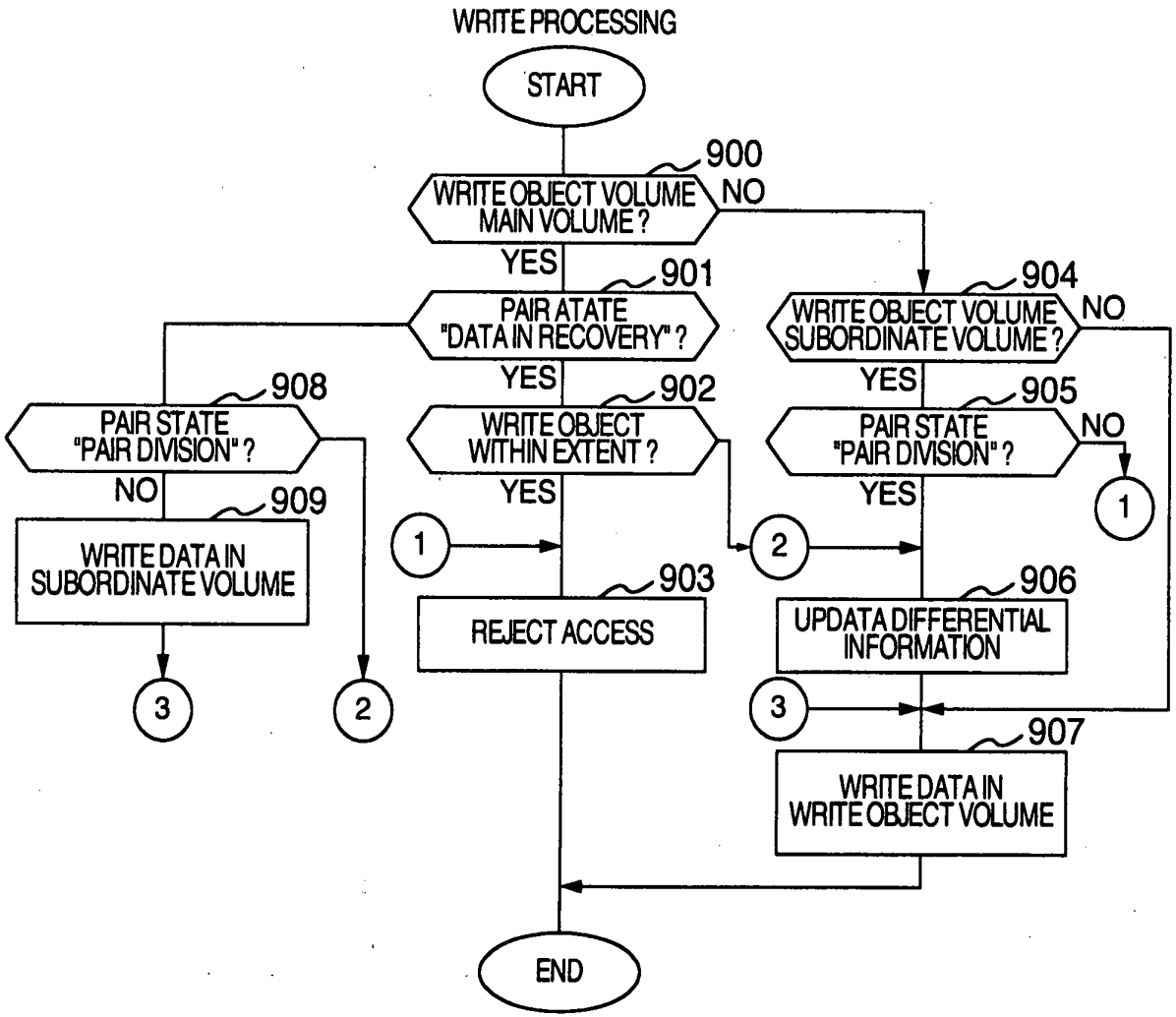
WRITE PROCESSING
START
900
WRITE OBJECT VOLUME MAIN VOLUME ?
NO
YES
901
PAIR ATATE "DATA IN RECOVERY" ?
YES
902
WRITE OBJECT WITHIN EXTENT ?
YES
903
REJECT ACCESS
904
WRITE OBJECT VOLUME SUBORDINATE VOLUME ?
NO
YES
905
PAIR STATE "PAIR DIVISION" ?
NO
YES
906
UPDATA DIFFERENTIAL INFORMATION
907
WRITE DATA IN WRITE OBJECT VOLUME
908
PAIR STATE "PAIR DIVISION" ?
NO
909
WRITE DATA IN SUBORDINATE VOLUME
1
2
3
END

FIG.10

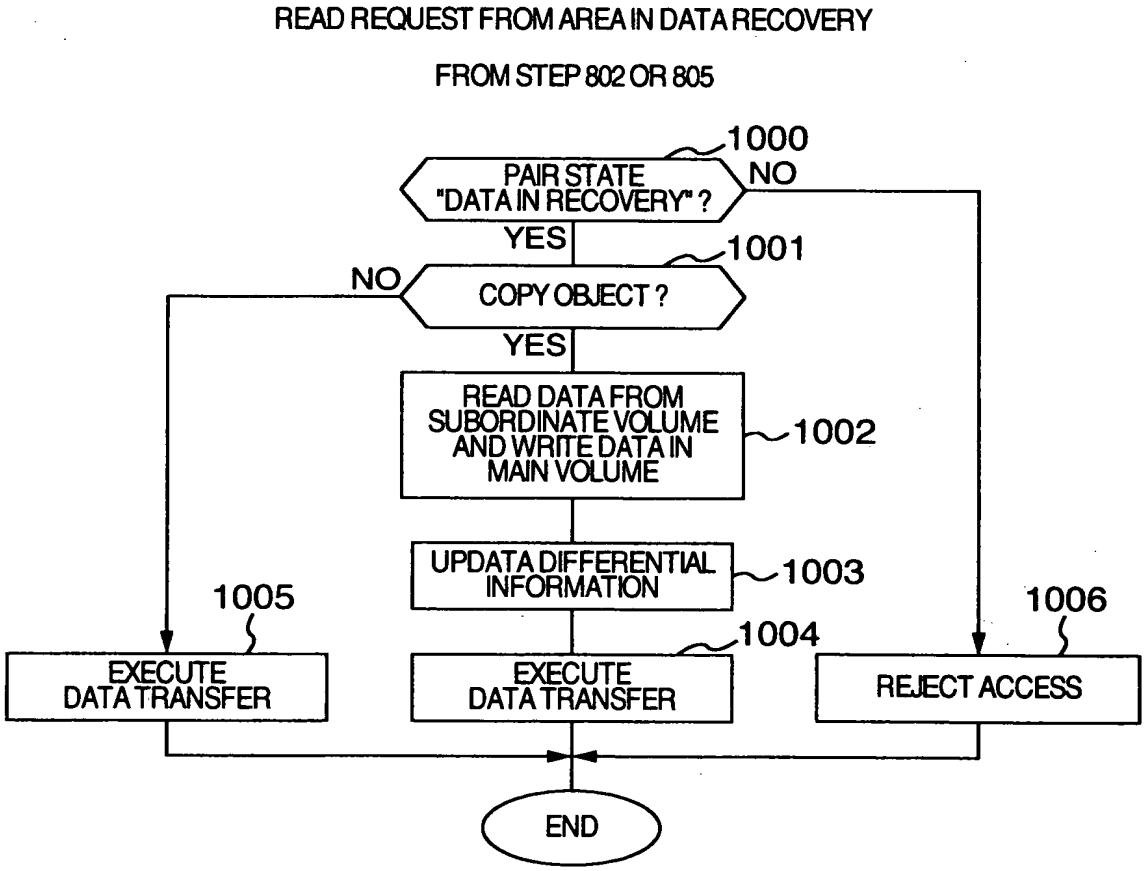
READ REQUEST FROM AREA IN DATA RECOVERY
FROM STEP 802 OR 805
1000
PAIR STATE "DATA IN RECOVERY" ?
NO
YES
1001
NO
COPY OBJECT ?
YES
READ DATA FROM SUBORDINATE VOLUME AND WRITE DATA IN MAIN VOLUME
1002
UPDATA DIFFERENTIAL INFORMATION
1003
1005
1006
1004
EXECUTE DATA TRANSFER
EXECUTE DATA TRANSFER
REJECT ACCESS
END

FIG.11

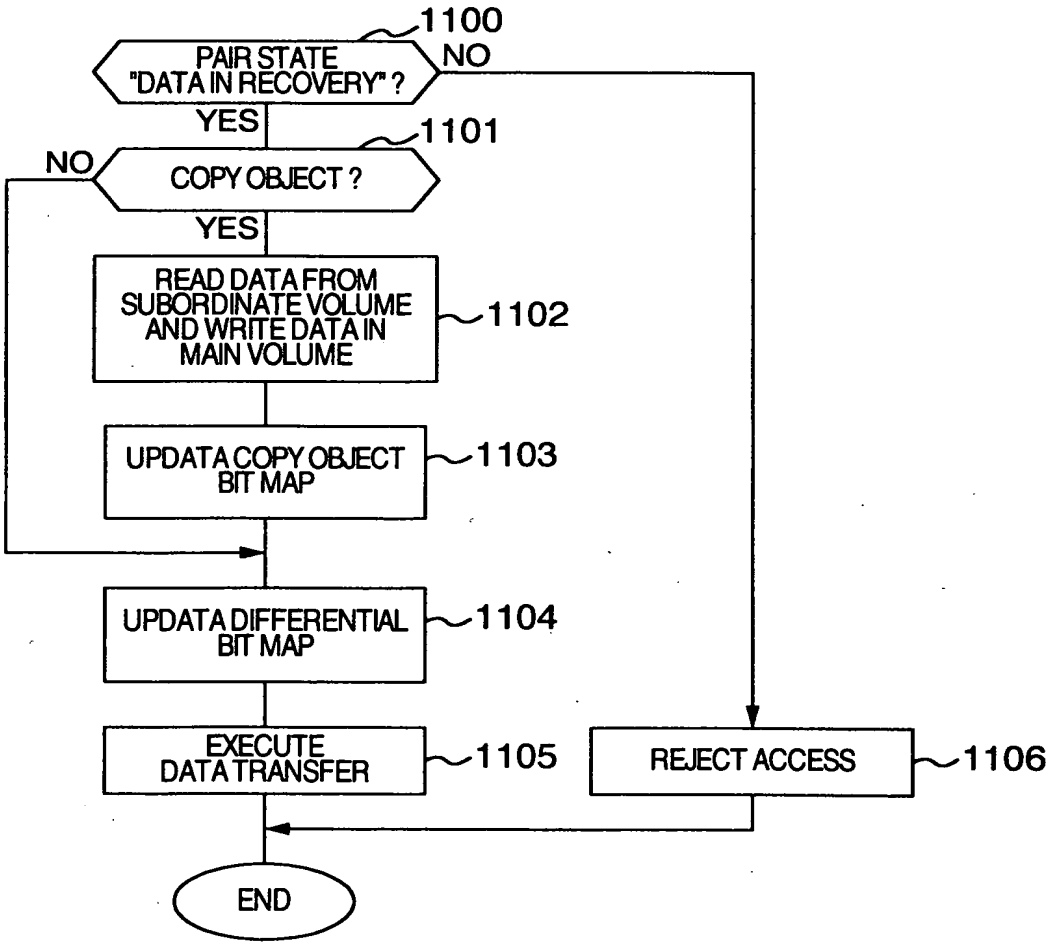
WRITE REQUEST IN AREA IN DATA RECOVERY
FROM STEP 902 OR 905
1100
PAIR STATE "DATA IN RECOVERY" ?
NO
YES
1101
NO
COPY OBJECT ?
YES
READ DATA FROM SUBORDINATE VOLUME AND WRITE DATA IN MAIN VOLUME
1102
UPDATA COPY OBJECT BIT MAP
1103
UPDATA DIFFERENTIAL BIT MAP
1104
EXECUTE DATA TRANSFER
1105
REJECT ACCESS
1106
END

FIG.12

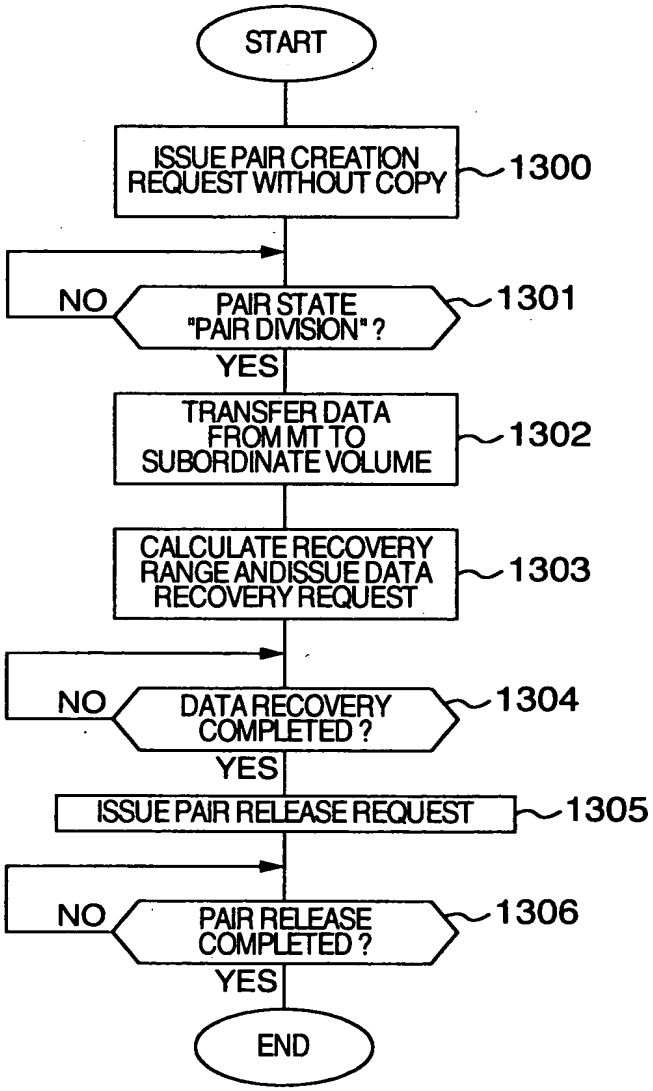
START
ISSUE PAIR CREATION REQUEST WITHOUT COPY
1300
NO
PAIR STATE "PAIR DIVISION"?
1301
YES
TRANSFER DATA FROM MT TO SUBORDINATE VOLUME
1302
CALCULATE RECOVERY RANGE AND ISSUE DATA RECOVERY REQUEST
1303
NO
DATA RECOVERY COMPLETED?
1304
YES
ISSUE PAIR RELEASE REQUEST
1305
NO
PAIR RELEASE COMPLETED?
1306
YES
END

FIG.13

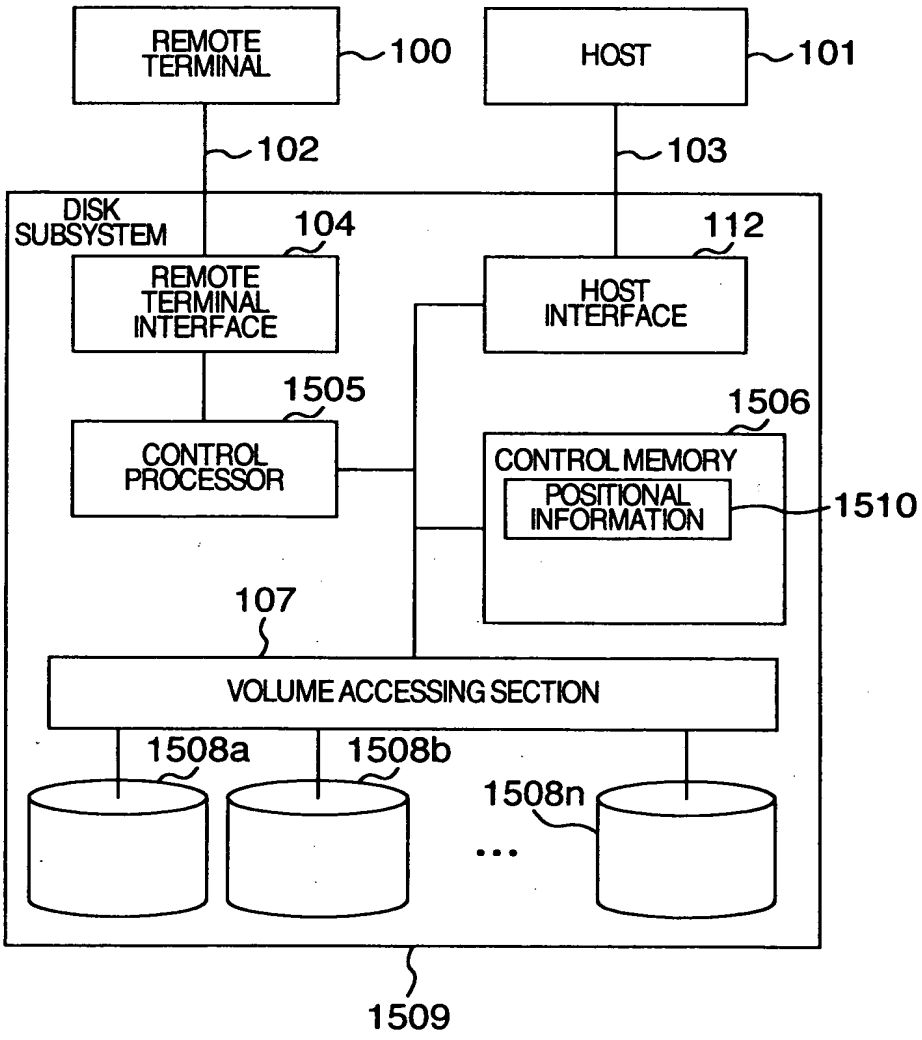
REMOTE TERMINAL
100
HOST
101
102
103
DISK SUBSYSTEM
104
112
REMOTE TERMINAL INTERFACE
HOST INTERFACE
1505
1506
CONTROL PROCESSOR
CONTROL MEMORY
POSITIONAL INFORMATION
1510
107
VOLUME ACCESSING SECTION
1508a
1508b
1508n
...
1509

FIG.14

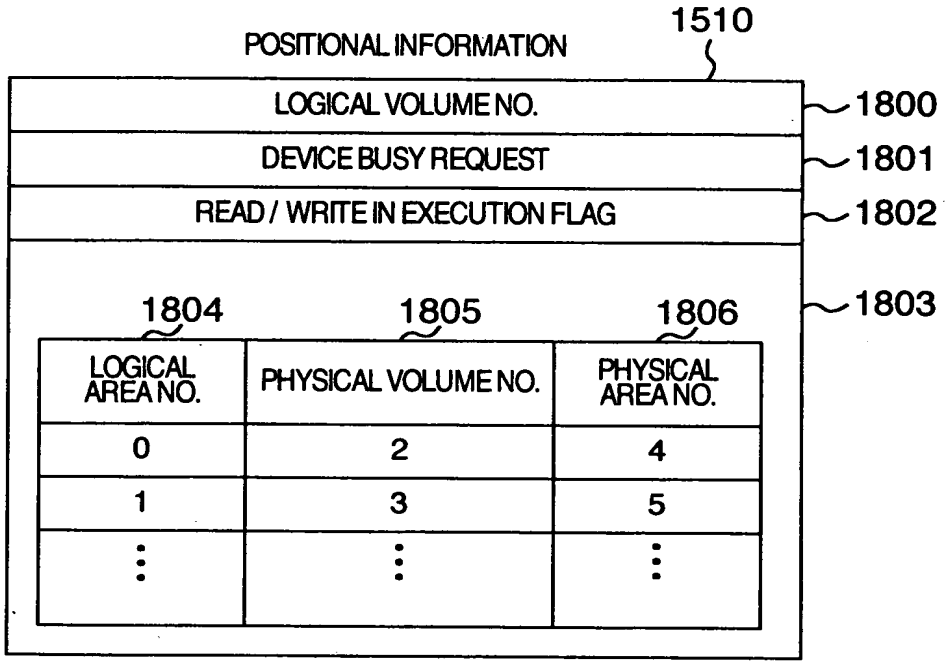
1510
POSITIONAL INFORMATION
LOGICAL VOLUME NO.
1800
DEVICE BUSY REQUEST
1801
READ / WRITE IN EXECUTION FLAG
1802
1803
1804
1805
1806
LOGICAL AREA NO.
PHYSICAL VOLUME NO.
PHYSICAL AREA NO.
0
2
4
1
3
5

FIG.15

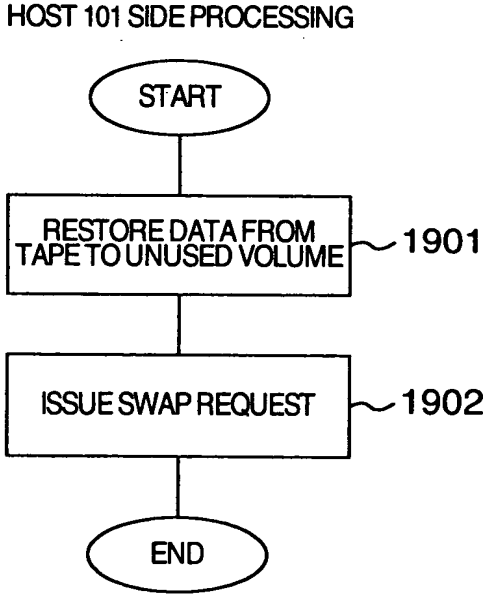
HOST 101 SIDE PROCESSING
START
RESTORE DATA FROM TAPE TO UNUSED VOLUME
1901
ISSUE SWAP REQUEST
1902
END

FIG.16

PROCESSING OF DISK SUBSYSTEM 1509

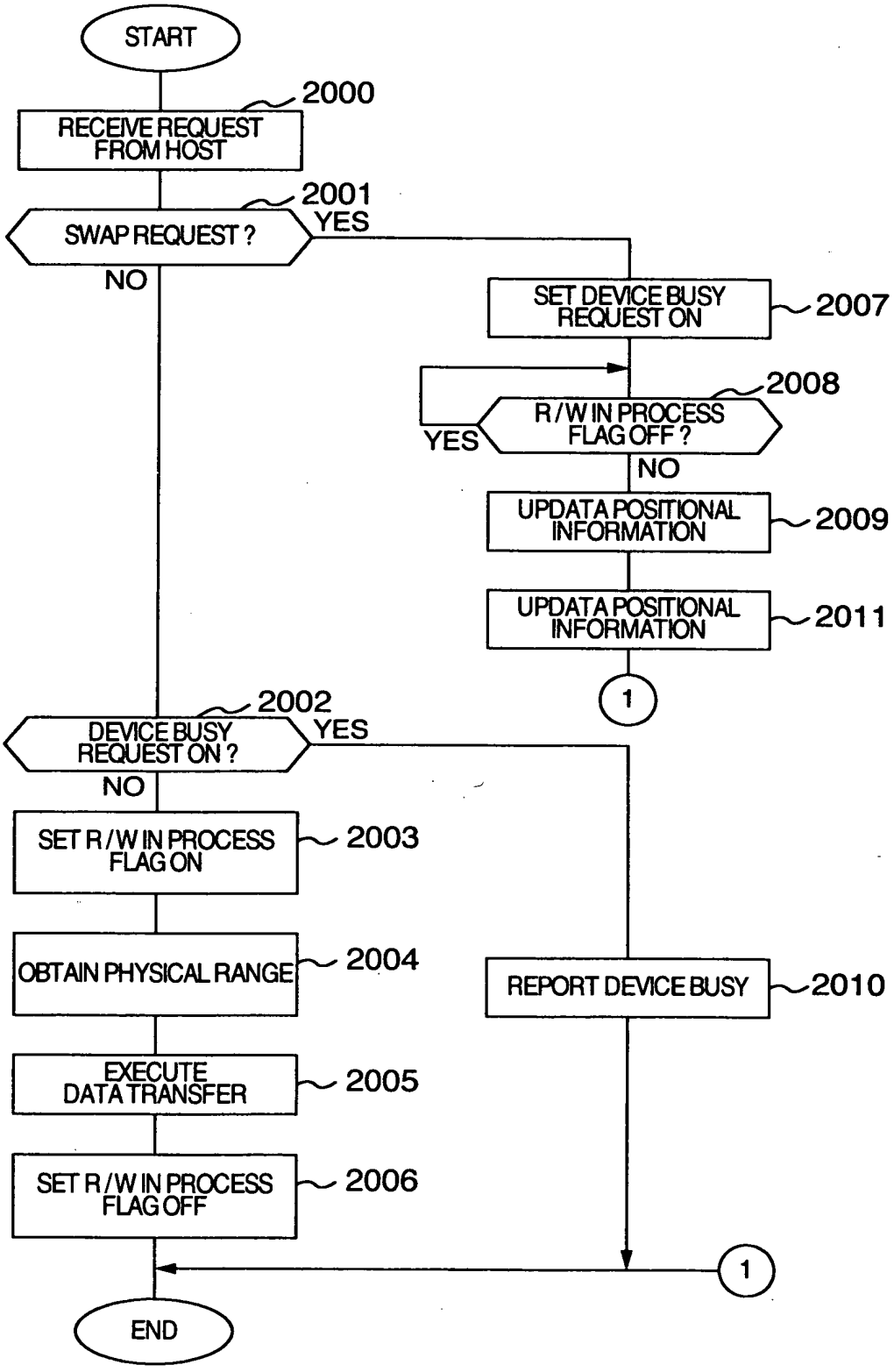

FIG.17A

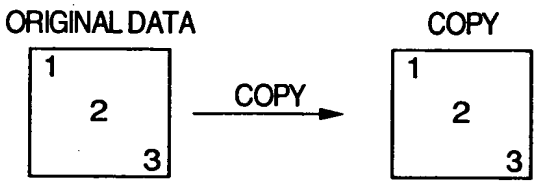

FIG.17B

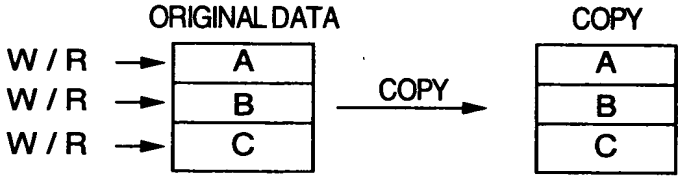

FIG.18A

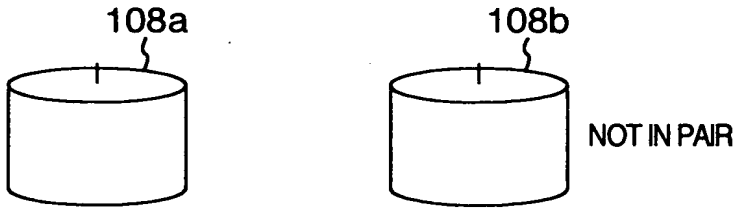

FIG.18B

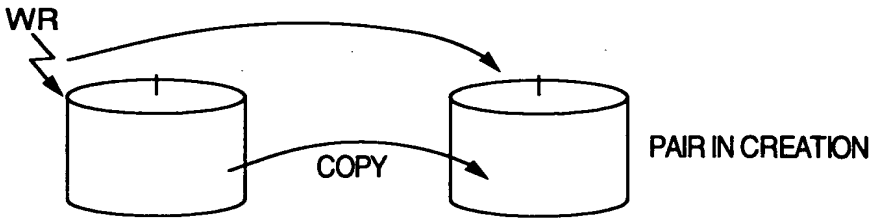

FIG.18C

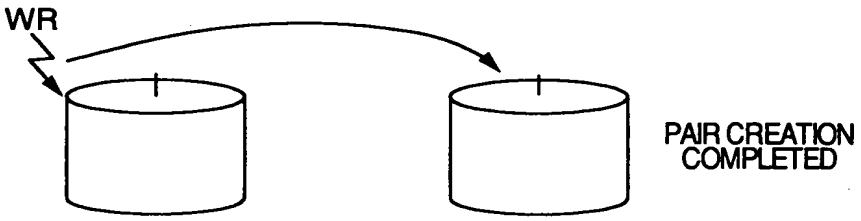

FIG.18D

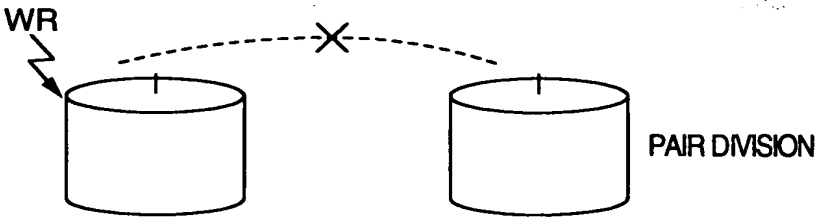
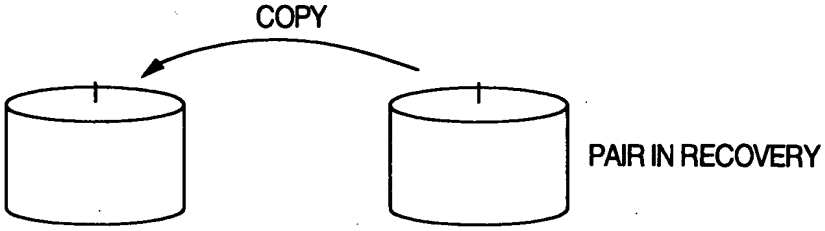
FIG.18E